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AGRICULTURAL RESEARCH
FOR DEVELOPMENT

Evaporation as an ageing procedure

When standardization needs metrology

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Presentation of the wood preservation laboratory

Research fields

- Rational use of lignocellulosic materials (wood)
- Service-life of ligno-cellulosic/wooden commodities
- Protection products & processes with low environmental impact

Main tasks

- Evaluation & comprehension of natural durability
- Development of products and wood processing with low environmental impact
- Evaluation of wood preservative chemicals

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Activities

- Research
- Expertises
- Tests

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Activities

- Research
- Expertises
- Tests → on durability of wood and wood-based products
  → on the protective efficacy of wood preservatives
  → on termite control products

Accreditation COFRAC for 9 tests

Accreditation
N° 1-1686

- **Termite tests** according to EN 117 and EN 118
- **Fungal tests** according to EN 113 and XP ENV 12038

  Associated accelerated ageing procedures according to EN 73 and EN 84
- **Termite control products tests** according to XP X 41-550

  Associated ageing procedure according to XP X 41-542
- **Natural durability** according to CEN/TS 15081-1

Wood = renewable material

→

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Determination of the resistance against wood-destroying agents !

Diversity of organisms

?

Evaluation of the impact
Biological degradation

Material heterogeneity

Staff Environment

Methods Material **Equipments**

Results

Test of a wood treatment product

- **Determination of its efficacy before being put on the market**

  Different chemical and physical tests

  Eco-toxicological evaluation

  Different **ageing and biological tests** (depending on the use class)

- **EN73 case** = **evaporation ageing test** (wind tunnel test)

  Prior to a biological test (termites or fungi)

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Evaporation ageing test

Wind tunnel test

Equipment requirement for EN 73

Wind tunnel → Compartmented and fitted with devices for heating and distribuing the air

Requirements

- The air shall be **dust-free**, shall **not be polluted** (to have **no impact on the test results**) and shall leave the tunnel without be able to reenter
- The **heating and distribution devices** shall be such that **temperature** and **air velocity** are maintained **constant and uniform** in **each** compartment

No dedicated available « wind tunnel » on the market

→ **Prototypes** (quiet similar in all laboratories)

Equipment requirement for EN 73

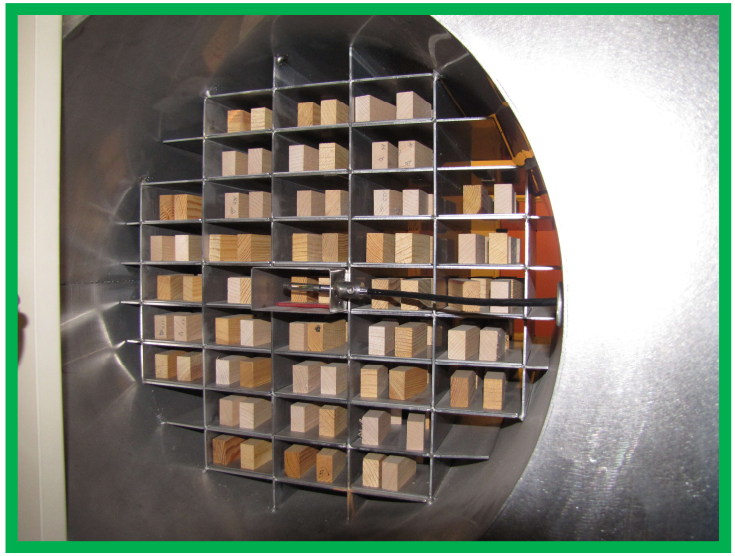
Air flow requirement for EN 73

Once treated wood samples placed in the compartments of the wind tunnel

- Air flow at a **temperature** of **(40 ± 2)° C**

  a **velocity** of **(1.0 ± 0.1) m.s^{-1}**

- Air flow has to be controlled at this temperature and velocity **at the outlet, on the axis** of **<u>each</u>** compartment



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Air flow measurement requirement for EN 73

To measure the characteristics of the air flow, requirements are

- A **device** which **mesures** and **records** the **air temperature**
- An **anemometer** capable of measuring **air velocity**

The laboratory has got a **standard probe** able to measure and record both temperature and air velocity

→ verified every 2 years by an **external COFRAC accredited laboratory**

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Air flow measurement requirement for EN 73

- To measure the temperature is not a problem
- To measure the air velocity at such a small tolerance is a **real issue**

→ Finding this standard probe on the market was **not an easy task**

→ **Capability** of the probe **around 2 only** (metrological limit)

A standard probe with a capability of 3 could have been found

- The price required for this option, including purchase and verification, is extremly high
- The cost of the standard probe traceability would be far too high to allow the wood preservation industry to pay this ageing test

Air flow measurement requirement for EN 73

What is the benefit (?) of this **irrealistic requirement** vs. the need for wood preservation industry in terms of both

- Determining the efficacy threshold of a wood protection product
- Stay concurrential on the market (when compared to non-wooden products)

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Calibration of a wind tunnel

- Check and verify temperature and air flow velocity at the outlet of each compartment before any test, using non-treated as « lures »
- This equipment qualification phase is **exhaustive** and **time consumming**

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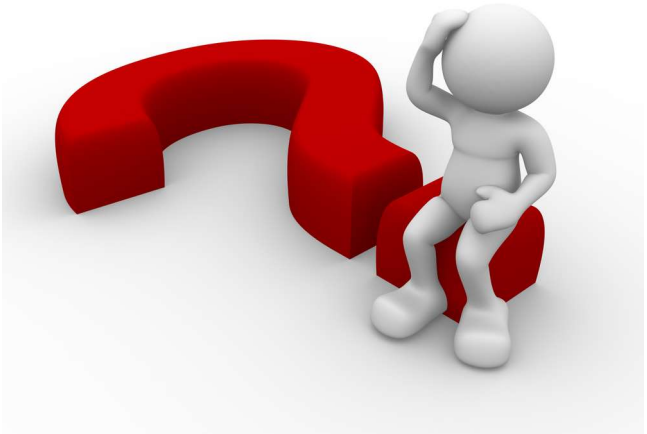
Calibration of a wind tunnel

- The laboratory has got **4 different tunnels**, based on the exact **same prototype model**, being build up the same time by the same company and **monitored in the same way**
- Despite these facts, and over many years of tunnel calibrations, **no rule or model could be found**, leading then to a large time spent each time to make a calibration prior to launching an evaporation test



Calibration of a wind tunnel

This calibration phase has also a rather **irrealistic metrological point of view**

- The calibration is down **at the outlet** of the compartment where there is **a turbulent flow regime**
- The calibration is down on lures and the test is done on treated samples on the same size, but even if marks are down on the grid of the compartments, **the samples cannot be exactly at the same place**
- The same remark on the place of the samples is true each time the samples are rotated

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Discussion & Conclusion

Zimbabwe
Reunion
Madagascar
Burkina Faso
Mexico
Laos
Brazil

Discussion

The team of wood preservation laboratory, also partipating at the **European standardisation committee**, has forwarded all these remarks to **the working group** in charge of the **EN 73 standard revision**

After several meetings, discussions and remarks, the revision project, the following major changes are

1. The anemometer has to be capable of measuring air velocity of **(1.0 ± 0.3) m.s^{-1}**

2. The temperature and air velocity should be measured and controlled when **entering** the compartments

Conclusion

- The example of the EN 73 standard related here underlines that **the metrology should be always taken in consideration** when **setting up or revising a standard**

- Wood preservative products are under scrutiny for their environmental impact on air and an hamonization in air flow measurements and associated tolerance should more emphasize, **metrology being one of the key factor for a realistic and objective evaluation of impact** of wood protection activity

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Thank you !

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